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Dairy Div

UNITED STATES DEPARTMENT OF AGRICULTURE
BULLETIN No. 651
OFFICE OF THE SECRETARY
Contribution from the Office of Farm Management
W. J. SPILLMAN, Chief

Washington, D. C. ▼ May 8, 1918

A FARM-MANAGEMENT STUDY IN ANDERSON COUNTY SOUTH CAROLINA

By

A. G. SMITH, Agriculturist

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INTRODUCTION.

In a farm-management and cost-determination survey of 112 farms in Williamston, Belton, Broadway, and Honeapath Townships, in Anderson County, S. C. (see fig. 1), it was found that in the organization and operation of the farms there are three outstanding factors that determine the degree of success. These are (1) yields; (2) efficiency in use of labor and equipment, or, as it may be indicated in this region, the acres of crops grown per work animal; and (3) the combination of enterprises. Aside from these there are minor factors, some of which are at times important; but the farmer who shows a high degree of skill in keeping up yields, utilizing labor and equipment, and in combining the proper enterprises in the proper proportions in the farm organization is almost invariably successful.

A correlation study made from the data of the survey showed that, as far as the methods used on these farms were concerned, yields constituted 62 per cent, acres per work animal 22 per cent, and the combination of enterprises 16 per cent of the total weight of the three factors in influencing the per cent return on the investment. Thus it might be said that yields were three times as important as acres per work animal and four times as important as combination of enterprises. This shows the relative importance of the major features of the farm-management problem and is an indication of how the effort to improve these farms should be divided.

The purpose of this bulletin is to show the bearing of these outstanding factors on the business of the farms surveyed, their influence on farm efficiency, and how that efficiency can be improved. Effort has been made to make the discussions such that anyone operating a farm under the conditions that prevail on the farms surveyed may, by applying the principles laid down, organize and operate his farm with a high probability of success. Many local and individual forces may suggest deviations from the general plan, but,

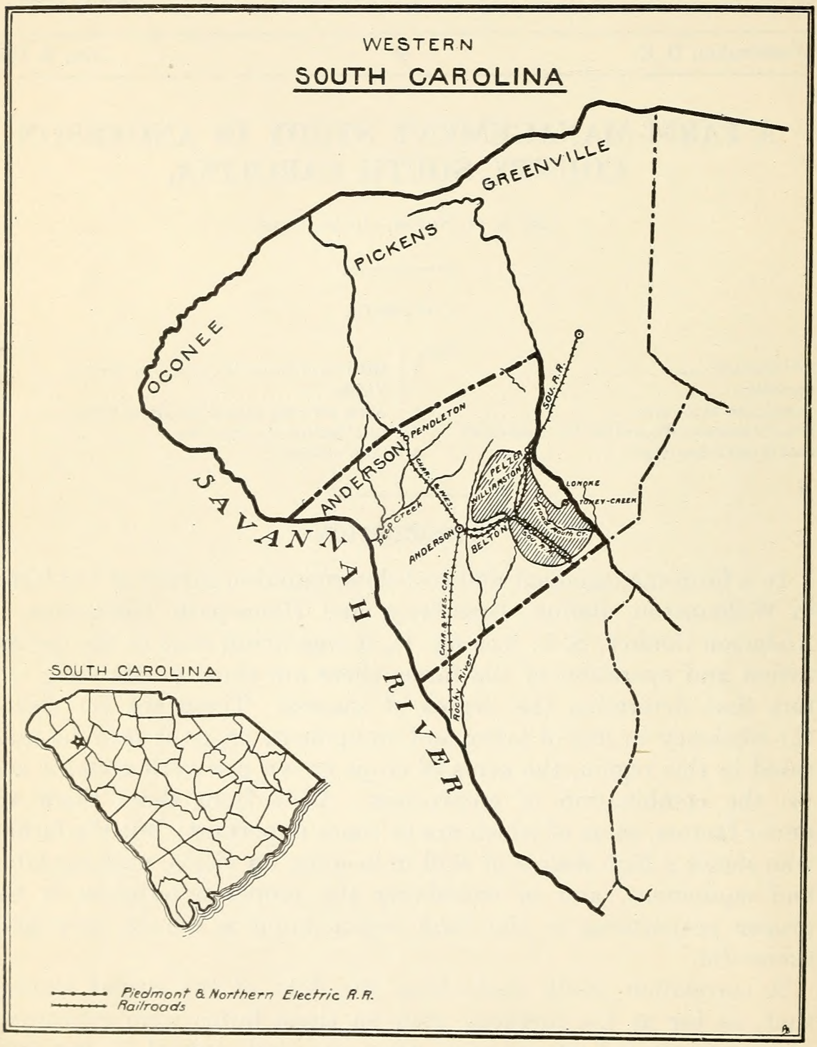

FIG. 1.—Map showing district surveyed (shaded area).

with rare exceptions, wide deviations from it probably will be followed by reduced returns.[1]

For the sake of a short name the territory from which the data used in this bulletin were gathered will be called the Belton area, as Belton is one of the principal towns of the region and is centrally located in the area surveyed.

In making the survey the average yield and average selling price of crops were recorded, not only for the then current year, but also for the five years prior to that of the survey (1914). The price of cotton for the year 1914, owing to the European war, was very low, and records based on that price would have been abnormal. For that reason, in computing the records, the average price of cotton for the five years prior to 1914 was used instead of the current price. The value of corn, oats, and cowpea hay was found to be practically the same in 1914 as the average of the previous five years, so no substitution of prices was necessary for these crops. It was found that the average yields of the more important crops for 1914 and for the five-year average were practically the same. The survey records, therefore, can be taken as typical of the farms, and by using the normal price of cotton the results for 1914 can be considered as closely approximating the average conditions for the region.

The 112 farms may be said to constitute a representative cross-section of the region.

SUMMARY.

The more important facts and conclusions brought out in this bulletin are, in brief, as follows:

Cost of producing the principal crops on the 112 farms studied: Cotton, 10.89 cents per pound gross lint; corn, $1 per bushel; oats, 43.3 cents per bushel; oat hay, $13.88 per ton; and cowpea hay, $14.10 per ton. Cotton was produced at its market value when yields were 240 pounds of net lint per acre and corn when yields were 17 bushels per acre.

Taking the crops as a whole, man labor was the largest item of cost and mule labor next. The rent of the land and the fertilizer cost were practically the same.

The farms made 3.65 per cent on the investment, and after deducting 8 per cent on the movable capital, the return on the investment in land and buildings was 3 per cent.

In increasing the efficiency of these farms, yields constitute the most important factor. It has thrice the weight in the per cent return on the investment of the acres per work animal and four times the weight of combination of enterprises.

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[1] Acknowledgments are due to Mr. C. E. Hope for making the partial correlation studies and for statistical assistance in compiling the material; also to the southern field men of the Office of Farm Management for assistance in securing the original data.

Thanks are extended to the farmers for the uniform courtesy with which the field men were received while making the survey.

As cotton is the predominating crop on these farms, the yield and acreage of cotton per work animal practically determine the degree of success.

High yields are obtained by using fertilizers, legumes, and good varieties of seed, and by good tillage. Still better yields could be obtained by applying lime also and planting winter cover crops.

Cotton is fertilized most heavily and corn next. Oats and wheat are fertilized lightly, but no fertilizers are applied to cowpeas.

The cost of producing crops on these farms declines rapidly with increase in yields, principally on account of the decrease in man and mule labor required per unit of yield.

Farms that planted from 20 to 23 acres of crops per work animal were the most profitable. Farms that had from 21 to 25, 41 to 45, and 61 to 65 acres of crops, good sizes, respectively, for one, two, and three mule farms, were more profitable than those that had intermediate sizes.

Two-mule farms with a good acreage per mule were the best farms, but there are larger farms under exceptional management which are as profitable.

The cost of producing feed crops is such that it is profitable to grow them only in sufficient quantities to insure a supply for home consumption. The tendency of farmers, and the most profitable procedure, is to grow the necessary home supplies and then grow all the cotton the conditions permit. Likewise the tendency of farmers, and, within certain limits, the most profitable procedure, is to grow more oats and cowpeas and less corn.

The high cost of producing feed makes the area poorly adapted to the production of live stock. Beef cattle, under present conditions, are practically out of the question, but there is a limited opportunity for dairying, particularly where there is a large family. Hogs should be produced on a small scale for home consumption. The small number of chickens kept per farm is due to the limited production of grain and live stock and the consequent small amount of waste feed.

Alfalfa and late Irish potatoes are promising crops for this area. Soy beans and velvet beans also offer possibilities.

As a general proposition, where from 20 to 23 acres of crops are planted per work animal, 40 per cent of the land should be planted in feed crops and 60 per cent in cotton.

DESCRIPTION OF THE AREA.

SOILS.

The 112 farms surveyed are all located on Cecil sandy loam soil. This soil, according to the Bureau of Soils, constitutes 55 per cent of Anderson County. It consists of brownish gray to brown, medium-textured, sandy loam top soil, from 4 to 8 inches deep, which changes rapidly with increasing depth to a red clay of a rather sandy nature. In nearly every field are local clay areas, or "gall spots," produced by erosion, the erosion being responsible also for some other modifications in the type. In occasional spots, gravel or "rotten stone" is mixed with the top soil and in some places the sand is deeper than in others, and here the soil is referred to as "sandy land." There are also areas where a tinge of yellow is found in the lower soil and the upper subsoil, such places being designated as "mulatto lands," although they are phases of the Cecil sandy loam type. These variations are of minor importance, however, so that, taken altogether, the soils for the area in which the farm-management survey was made were quite uniform, and are therefore not responsible to any considerable degree for the variation in the character and efficiency of the farms.

TOPOGRAPHY AND DRAINAGE.

The topography grades from level to hilly. Most of the land is terraced. The drainage problem is that of keeping the rains from washing gullies on the hillsides and of removing the water from the lowlands. Open ditches are frequently used to carry the surplus water off the hillsides, although in a good system of terracing but little water is allowed to run off. In periods of heavy rainfall the water frequently breaks the terraces, making repairs an expensive item. Where lowlands are drained, open ditches are used exclusively.

TRANSPORTATION FACILITIES AND MARKETS.

Except in continued rainy weather the roads are good, although in some places the grades at all times make the hauling of heavy loads difficult. Steam railroads and trolley lines, each running in three different directions out of Belton, furnish adequate transportation facilities for the region.

The cotton mills in Anderson and adjoining counties afford a good local market for lint cotton, and the cotton-oil mills buy all the cotton seed offered for sale, but for other products the market is limited. Cattle and hogs are either exchanged among farmers or are sold to local butchers. It is almost impossible to sell a veal calf. It is difficult to sell poultry, eggs, and butter. Most farmers who have such products for sale peddle them around town; a few deliver to private customers. There is a limited retail market for vegetables at Honea-path, Belton, Williamston, and Pelzer, largely in the mill communities. In general, the local merchants do not buy country produce for resale to wholesalers, as is the custom in many sections of the country, though there seems to be a growing tendency to do this. There is no wholesale market for hay and grain, but if a surplus is produced some of it may be sold in towns or to neighboring farmers. Owing to these general market conditions, there often exists a close relationship between the financial success of a farmer and his salesmanship, or ability to find a market for his produce.

The local conditions which make the marketing of poultry and other by-products of the farm unprofitable can be overcome by merchants on the one hand in establishing connections with larger city markets, and by farmers on the other hand by organization as is practiced in many other sections of the country. The great need for increased poultry production warrants a study of this problem and the experience and the information of the Department of Agricultutre are available on request.

LABOR.

Labor is both white and colored and is comparatively abundant and cheap. The monthly wage varies from $12 to $20 per month, the average with house, garden, and wood furnished, approximating $15 per month. Day labor is paid from 50 to 90 cents per day, 70 cents being a fair average. Cropper labor, an arrangement in which the laborer receives a part of the crop in lieu of wages, is used quite extensively, especially on the larger farms. The average value of the operator's services on 112 farms, aside from perquisites, was estimated at $221 per year.

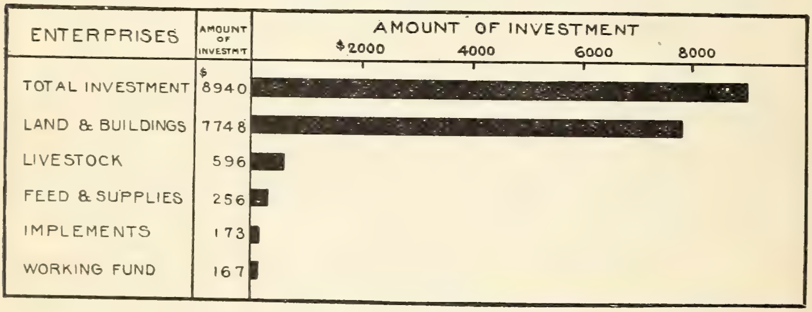

FIG. 2—Investment per farm.

Women and children do a large part of the work in growing and harvesting crops. Of the total labor costs chargeable to actual crop production, one-third was for labor performed by women and children. This labor is used principally in hoeing and picking cotton. Families are usually large among both the whites and the negroes.

GENERAL CHARACTERISTICS OF THE FARMS SURVEYED.

The largest farm in the area surveyed contained 1,400 acres, of which 895 was in cultivation; the smallest had 15 acres, with 12.5 in cultivation. The average size of the 112 farms was 135.8 acres, with an average of 71.7 acres in cultivation. Exclusive of land rented out, the average size was 119.7 acres, with 63.2 acres, or 52.8 per cent, in cultivation. The total average investment per farm (see fig. 2) was $8,940, distributed as follows: Land and buildings,

$7,748; live stock, $596; implements, $173; feed and supplies, $256; and working fund, $176. The average value of the land was $57.05 per acre. The average rental value of the crop land was $4.23 per acre. The land in cultivation was planted in crops (see fig. 3) in the following percentages: Cotton, 63.1; corn, 23.6; oats, 12.1; wheat, 1.8; and miscellaneous crops, 0.4. One per cent of the crop area was planted in corn after a small-grain crop. Cowpeas, other than those grown in corn and following some other crop, were grown on 9 per cent of the crop area. All the farms (see Table I) planted cotton and corn. More than half planted oats for hay and more than one-third oats for grain. Also, more than one-third of the farm planted cowpeas unmixed with another crop, for hay alone, while 19 farms planted cowpeas separately for seed. Twenty-one farms grew wheat.

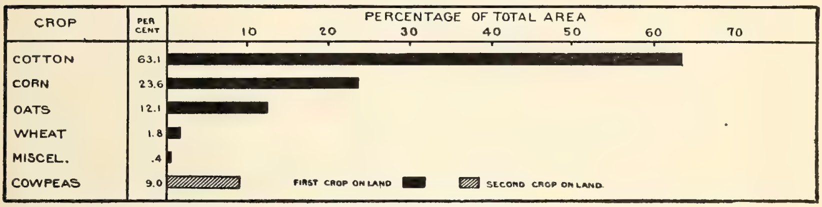

FIG. 3.—Land in crops.

TABLE I.—*Number of farms planting each specified crop, acres per farm, and yield per acre.*

Item.	Cotton.	Corn.	Oats.	Oat hay.	Cowpea hay.	Cowpea seed.	Wheat.	Irish potatoes (1915).
Number of farms planting....	112	112	41	68	39	19	21	14
Acres per farm..............	40	15	8.6	7.3	9.9	4.4	.6	1.5
	Pounds.	*Bushels.*	*Bushels.*	*Tons.*	*Tons.*	*Bushels.*	*Bushels.*	*Bushels.*
Yield per acre..............	233	16.8	21.7	0.79	0.73	4.9	6.0	84.7

The average acreage of cotton per farm was 40 and of corn 15. None of the other crops averaged as much as 10 acres per farm. Cotton yielded 233 pounds of net lint per acre, corn 16.6 bushels, and oats 21.7 bushels. Oat and cowpea hay each approximated three-fourths of a ton per acre, while cowpea seed made 4.9 bushels and wheat 6 bushels per acre. Many other miscellaneous crops were also planted. The most important of these included cowpeas for hay and seed combined grown on 25 farms, and cowpeas with sorghum, grown on 10 farms. Some cowpeas were also planted in corn for seed and soil improvement. Besides these crops, small patches of sorghum were grown for sirup and stock feed; and sweet potatoes, Irish potatoes, and truck were planted both for home use and for a limited sale in the towns. A small amount of fruit was also produced, and practically every farmer had a garden.

The items of farm receipts (see fig. 4) were in the following percentages: Cotton, 79.8; corn, 3.3; oats and oat hay, 1.2; cowpeas, 0.8; miscellaneous crops, 1.6; live stock and live-stock products, 3.6; increase in feed and supplies, 1.1; and miscellaneous, 8.6. Four-fifths of the receipts came from cotton. Considering the farms on an owner basis,[1] the receipts per farm were $1,617, the expenses $1,060, and the farm income, $557. Deducting from the farm income 8 per cent on the investment (the current rate on borrowed money), the result is a minus labor income of $158.[2] Counting interest at 5 per cent, however, there is left a labor income of $110. After deducting the value of the operator's services from the farm income, the return on the investment was found to be 3.65 per cent. If, however, in addition to the operator's services, 8 per cent on the movable capital or the value of the live stock, implements, feed and supplies, and working fund, be deducted from the farm income, there is left a return of 2.99 per cent on the land and buildings. In other words, money invested in farm lands on this area, after paying all expenses, earned approximately 3 per cent on the investment.

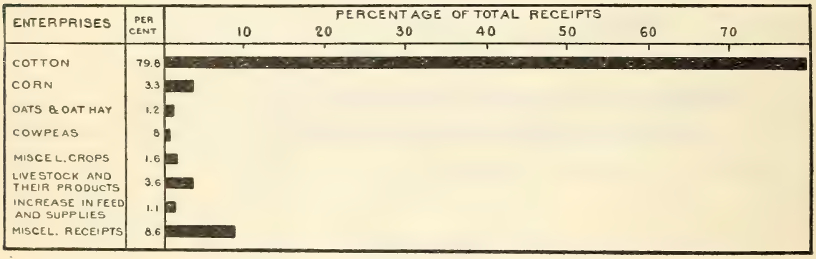

FIG. 4.—Farm receipts.

The 112 farms used 337 head of work stock, or an average of 3 per farm. Usually there were as many families as mules, approximately an average of 3 families, including both white and colored, living on each farm.

COST OF PRODUCING CROPS.

The cost of producing the more important crops and the value of each were determined on the basis of acreages and yields shown in Table I. The cost of producing cotton, the major crop, was 10.89 cents per pound.[3] (See Table II.) The value was 11.5 cents, leaving a profit of 0.61 cent per pound. Corn cost $1 per bushel, but the value was less than the cost, or $0.983 per bushel. Oats and oat hay, as they are grown, are very profitable crops. Cowpea hay cost $14.10 per ton, and was worth $19.17. Cowpea seed, grown after some other crop, was produced at an apparent loss. Wheat cost $1.34 per bushel, and was worth $1.24. In 1914 only 2 farms grew an acre or more of Irish potatoes, but as the farmers were increasing the acreage, records were obtained on 14 farms in 1915. The cost for that year was 52 cents per bushel, and the value $1.01.

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[1] By "owner basis" is meant the consideration of a farm as though it were owned and operated by a single person. This applies to farms operated under any system of land tenure.

[2] Labor income: The farmer's earnings over and above expenses and interest on the money he has tied up in his business.

[3] Yields of cotton are expressed in this bulletin in the terms of net lint, while the costs and values include the bagging and ties, and are expressed in terms of gross lint. The bagging and ties are approximately 4 per cent of the weight of the gross lint.

TABLE II.—*Cost of producing crops in the Belton area compared with farm values.*

Item.	Cotton per pound gross lint.	Corn per bushel.	Oats per bushel.	Oat hay per ton.	Cowpea hay per ton.	Cowpea seed per bushel.	Wheat per bushel.	Irish potatoes per per bushel (1915).
Cost	$0.1089	$1.001	$0.433	$13.88	$14.10	$2.95	$1.34	$0.52
Farm value	.1150	.983	.657	23.97	19.17	1.98	1.29	1.01

Five-sixths of the cotton, four-fifths of the corn, and seven-eighths of the oats and oat hay were grown either by the owners of the land or under their immediate supervision.

TABLE III.—*Itemized distribution per dollar of cost of producing crops.*

Itemized costs.	All crops.	Cotton.	Corn.	Oats.	Oat hay.	Cowpea seed.	Cowpea hay.	Wheat.
Rent	$0.158	$0.141	$0.210	$0.173	$0.206	$0.142	$0.225	$0.187
Man labor	.378	.411	.304	.217	.234	.544	.243	.234
Interest on working fund	.013	.014	.011	.009	.012	.016	.009	.011
Mule labor	.210	.202	.242	.190	.205	.182	.264	.223
Implement cost	.030	.028	.036	.036	.034	.031	.043	.029
Seed	.028	.016	.008	.116	.119	.073	.212	.100
Fertilizer	.160	.160	.189	.211	.185	....	....	.159
Miscellaneous costs	.023	.028	....	.048	.005	.012	.004	.057
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

TABLE IV.—*Itemized distribution of costs per unit of principal crops.*

Itemized costs.	Gross lint cotton per pound.	Corn per bushel.	Oats per bushel.	Oat hay per ton.	Cowpea hay per ton.	Cowpea seed per bushel.	Wheat per bushel.
Rent	$0.0154	$0.210	$0.075	$2.86	$3.08	$0.42	$0.25
Man labor	.0448	.305	.094	3.25	3.31	1.61	.31
Interest on working fund	.0015	.011	.004	.16	.13	.05	.02
Mule labor	.0220	.242	.082	2.85	3.61	.54	.30
Implement cost	.0031	.036	.016	.47	.58	.09	.04
Seed	.0017	.008	.050	1.66	2.91	.21	.13
Fertilizer	.0174	.189	.091	2.56	....	....	.21
Miscellaneous	.0030	....	.021	.07	.06	.03	.08
Total	.1089	1.001	.433	13.88	13.68	2.95	1.34

The distribution of costs is shown in Table III. Taking the crops as a whole, man labor was the largest item of cost, 37.8 cents out of every dollar going for that purpose. Mule labor came next, 21 cents out of each dollar being charged to work-stock costs. Fertilizer and rent were practically the same; 16 cents was spent for the former and 15.8 for the latter. Man and mule labor, fertilizer, and rent constituted most of the cost of production, the total expense of these items being 90.8 cents out of a dollar. The remaining 9.2 cents per dollar of cost was taken up as follows: Implements, 3 cents; seed, 2.8 cents; miscellaneous costs, 2.3 cents; and interest on working fund, 1.3 cents. The distribution of the items of cost for the principal crops is also shown in Table III. The total amount per crop unit chargeable to the various items of cost is shown in Table IV. This gives a further idea of how the costs are distributed among the various crops. The items of cost per pound of gross lint cotton are of most interest, man labor being 4.48 cents, mule labor 2.20 cents, fertilizers 1.74 cents, and rent 1.54 cents. Some of the notable influences that increase or decrease the cost of producing crops in the Belton area and the effect these costs have on the combination of enterprises will be shown in later discussion.[1]

METHODS OF MEASURING SUCCESS IN FARMING.

In showing the effect of one or more factors upon the success of a farm, some standard or standards must be used whereby the success can be measured. It has been quite well determined that no single standard can be used as an absolute measure. The viewpoint of those interested in the farm is not always the same, and what may be profitable to one may be unprofitable to another. A tenant, for example, may operate a farm that is profitable to him but which is a losing proposition to the landlord, or an operator may realize a high income by exploiting labor. Consequently more than one standard must often be used if a farm enterprise is to be judged correctly.

Some of the more important measures applicable in the Belton area are:

1. Farm income, which is the difference between receipts and expenses.

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[1] The items included in the costs were rent, man labor, interest on working fund, mule labor, seed, fertilizer, and miscellaneous costs. The renting value of the land covered the cost of the land, the building and fencing charges, insurance, and taxes. The man labor included paid or hired labor, and family, operator, and landlord labor. The interest on the working fund was the interest on the cash used to meet the current expenses. The work stock cost was the annual cost of keeping the work stock. The implement or machinery cost was the expense of using the implements for the year. The seed cost was the value of the seed used in planting the crops. The fertilizers included commercial fertilizers purchased and the barnyard manure applied. The miscellaneous costs were those peculiar to a crop, such as ginning, thrashing, etc.

In arriving at the costs, the number of productive days' work, both of man and mule labor, was ascertained for each crop, and the total for the farm. The total labor costs were then divided on the basis of the number of productive days' work on each enterprise. If, for example, the cost of man labor on a farm was $750, and the total number of productive days' work was 500, the cost per productive day was $1.50. If 300 days were used on cotton, 80 on corn, 30 on oats, 30 on cowpeas, 20 on live stock, and 40 on miscellaneous enterprises, the man-labor charge against the crops would be: Cotton, $450; corn, $140; oats, $45; cowpeas, $45; live stock, $30; and miscellaneous enterprises, $60. The labor on repairs and upkeep of the farm, which goes as nonproductive labor, or labor from which no direct income was received, was not recorded, but by spreading the labor costs on the basis of productive labor, this was cared for automatically. The mule-labor cost was spread in the same way as that of man-labor. The interest on the working fund was distributed on the basis of man-days and the implement costs on the basis of mule-days.

2. Labor income, which is what is left of the farm income after deducting a fair rate of interest on the investment.
3. The rate of income on capital after deducting a fair amount for the operator's services.
4. The cost of production per unit of measure.
5. Net income per mule. In this bulletin this will represent the net income of both the labor and the investment in the animal.
6. Yields per acre.

These measures and a few others will be used as occasion requires in the following pages. If a farm ranks high when measured by all of these, it safely can be regarded as an efficient and successful farm.

YIELDS.

As has previously been stated, yields are the most important factor in determining the success of the farms in this area. In reducing the cost per unit of product, yields exert a greater influence than any other factor.

Since cotton is by far the most important source of income on these farms, the acre yield of this crop is a very safe index of the efficiency of the farming. In Table V 110 of these farms were divided into groups based on the yield of net lint per acre. Nineteen of them had yields of 175 pounds or less. On these 19 farms the average cost of a pound of lint cotton was more than 15 cents. The income of these farms was not sufficient to pay expenses, so that after deducting the estimated value of the operator's services there was a net loss of 0.71 per cent on the investment. In the next group, consisting of farms on which the yield was from 176 to 225 pounds per acre, cotton cost 13.5 cents, and there was a profit of 2.54 per cent on the investment. As the yield increases the cost of lint cotton per pound decreases and the rate of income on investment increases. In the last group, where the yield is 326 pounds or more, the cost per pound falls to 9.6 cents, while the profit on the investment rises to 6.59 per cent.

TABLE V.—*Relation of yields of cotton to farm efficiency.*

Pounds of net lint cotton per acre.	Number of farms.	Average yield.	Per cent return on investment.	Cost per pound of gross lint cotton.
		Pounds.		
175 or less	19	159	[1] 0.71	$0.1554
176 to 225	24	198	2.54	.1353
226 to 275	34	247	4.45	.1170
276 to 325	19	305	6.12	.1108
326 or more	14	371	6.59	.0961

[1] Loss.

Yields of corn have much less influence on the per cent return on investment than does cotton, as corn is a minor crop. But the influence of yield on the cost of production is just as marked with corn as it is with cotton. In Table VI the farms are grouped on the basis of yield of corn per acre. Twenty-five farms, producing 11 bushels or under per acre, grew corn at a cost of $1.48 per bushel. Twenty-three farms that made from 12 to 15 bushels per acre produced corn at $1.14 per bushel, or 25 cents per bushel less than the cost for the first group. Thus costs steadily decrease as yields increase. In the group with the highest yields, 19 farms, making 26 bushels or more per acre, the cost was but 77 cents per bushel.

TABLE VI.—*Relation of yield to cost of producing corn.*

Bushels of corn per acre.	Number of farms.	Average yield.	Cost per bushel.
		Bushels.	
11 or less	25	9.5	$1.48
12 to 15	23	13.5	1.14
16 to 19	19	17.5	.94
20 to 25	24	22.3	.86
26 or more	19	29.1	.77

Cotton did not pay the cost of production until the yield was 240 pounds of lint per acre and corn not until the yield was 17 bushels per acre. In other words, taking an average of the farms, cotton, when costs are computed by standard cost-accounting methods, was produced at a profit only when yields were more than 240 pounds per acre and corn when yields were more than 17 bushels per acre. This gives an idea of the yields farmers in this territory must obtain to make the production of these crops profitable.

The most striking reduction in costs with increase in yield is in the man labor and mule labor per crop unit. Rent, equipment, and seed costs also decrease with increasing yield, but these are of less importance in this area. On the other hand, fertilizer costs per unit are highest where the best yields are made. Man labor and mule labor, which on 112 farms constituted five-eighths of the cost of growing cotton and nearly one-half of the cost of growing corn, are the items in which the greatest difference occurs. The labor per acre increases with yields, but the labor per unit decreases, for, outside of harvesting, very nearly the same labor is required whether the yields are high or low; and the variation in mule labor, even in harvesting, is of little consequence.

HOW HIGH YIELDS ARE OBTAINED.

The weather during the growing season has much to do with the yield of any crop. But since all these yields were obtained in the same season and in the same locality, differences in the weather can not account for the differences in yield observed on these farms. The character of the soil is another important factor, but the soil is approximately of the same type on all farms included in this survey. The previous treatment of the soil differs widely from farm to farm and undoubtedly accounts for much of the difference in yield on different farms. But in this study it was not practicable to secure the complete history of soil treatment for a series of years for each farm. This is not so unfortunate, however, as might at first appear, for it is fair to assume that the treatment of soil on each farm, during the year to which this study chiefly relates was, in general, the same that had been in vogue during several previous years.

Other factors having an important influence on crop yields are manure and commercial fertilizers, the succession of crops on the land, or the crop rotation, live stock, the kind of seed, and the methods of tillage used. So far as data are available concerning the effects of these factors they are given in the following pages.

One of the principal methods of maintaining or increasing yields in the Belton area is by the application of fertilizers. These consist principally of acid phosphate, cottonseed meal, nitrate of soda, and some form of potash salts, although some basic slag, sulphate of ammonia, fish scrap, blood meal, and tankage are used.

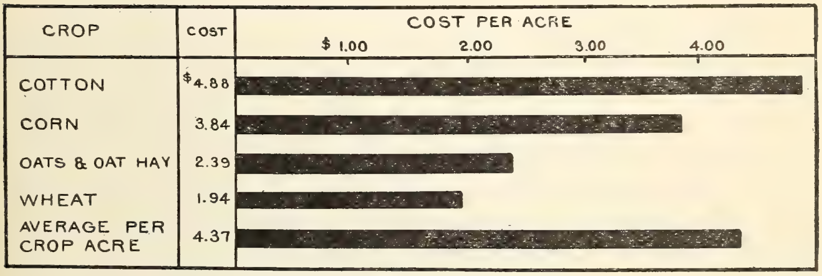

FIG. 5.—Cost of fertilizer per acre.

The common custom in applying fertilizers (see fig. 5) is to make the heaviest applications to cotton, the next heaviest to corn, to apply only small amounts to oats and wheat, and none at all to cowpeas. The average cost per acre of fertilizer applied in 1914 to the principal crops was: Cotton, $4.88; corn, $3.84; oats and oat hay, $2.39; and wheat, $1.94. The average for all crops was $4.37 per crop acre. Most of the barnyard manure, of which there was only a small quantity, was applied to cotton.[1]

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[1] The economic reason for the heavier fertilization of cotton is its higher value per acre and the consequent greater profit from fertilizing. The average acre value of cotton and cotton seed in 1914 was $32.26, and of corn and corn fodder $19.92. Suppose, for example, an application of $4 worth of fertilizer per acre increased the yield of the crop by 25 per cent, which is not an uncommon occurrence, the gross value of the increase of cotton would be $8.07 per acre, leaving a margin of $4.07 as against an increase with corn of $4.98 and a margin of $0.98.

The relative prices of fertilizers and crops, particularly cotton, determine the amount of fertilizers it is profitable to apply. An increase in the relative price of fertilizers reduces the amount, while an increase in the price of crops increases it. The tables are based upon the 1914 prices of fertilizer. The use of fertilizers in South Carolina has enormously increased within the last quarter of a century, principally because of the higher prices received for cotton.

In Table VII the records are arranged in groups according to the amount of fertilizer applied to cotton, as measured by the cost of the fertilizer.[1] Beginning with a group of records where $3 worth or less of fertilizer per acre was used and the average yield was 200 pounds of lint per acre, the yields gradually increase as the amount of fertilizer used increases until an application of $7 or more of fertilizer is reached.

TABLE VII.—*Relation of the cost per acre of fertilizer applied to yield, and cost of cotton.*

Cost of fertilizer per acre.	Number of records.	Average cost of fertilizer per acre.	Yield of net lint cotton per acre.	Cost per pound of producing gross lint.
			Pounds.	
$2.99 or less	21	$2.26	200	$0.1142
$3 to $4.99	61	4.02	221	.1140
$5 to $6.99	44	5.62	272	.1028
$7 or more	23	8.64	276	.1217

But this increased yield did not always give a decrease in the cost of production. With the exception of the group of records using $5 to $6.99 worth of fertilizers per acre, there is not much difference in the cost per pound of lint in any of the groups. The earliness of the fall season was at least partially responsible for the high cost of production in the group using the most fertilizers. Heavy application of fertilizers causes late maturity, and in 1914 late cotton was cut short by the frost. It is probable that in most years the heavier application of fertilizers would have given the higher yields and that the cost of production would have been lower. The yields of corn increased (see Table VIII) from 14.2 bushels where less than $3 worth of fertilizer was used per acre to 21.8 bushels where $5 worth or more were used. There was no marked change in the cost per bushel, which was $1 in the group with the least fertilizer expense and $0.96 in the group with the highest.

TABLE VIII.—*Relation of cost of fertilizer applied to corn to yield, and cost of production.*

Cost of fertilizer per acre.	Number of records.	Average cost of fertilizer per acre.	Yield of corn.	Cost per bushel.
			Bushels.	
$2.99 or less	53	$1.75	14.2	$1.000
$3 to $4.99	63	3.74	18.4	.970
$5 or more	32	6.50	21.8	.959

In finding the effect of fertilizer on oats and oat hay (see Table IX) the two crops were combined. Yields can not be shown in this way, but the values are indicative. The cost of fertilizer per acre ran from nothing in 34 cases to an average of $5.01 in 20 cases. The highest value per acre and the greatest profit were with applications costing less than $2 per acre and averaging $1.42 per acre. The residual effect of the fertilizers applied to other crops is responsible for this showing. It is an indication that the best farmers fertilize cotton and corn heavily and oats lightly. Where such a practice is followed nothing but nitrate of soda is ordinarily used as a direct application to the oats. In normal times this costs from $1 to $2 per acre for the amount of fertilizer used in the most profitable group.

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[1] The application of fertilizer and the yields and costs were obtained for the individual crops cultivated both by the operator and the cropper. Hence Tables VII, VIII, and IX show more records than there are farms, as the crops grown by the operator alone and by the croppers are considered as distinct cases.

TABLE IX.—*Relation of the fertilizer practice to the cost, value, and profit per acre of oats and oat hay.*[a]

Cost of fertilizer per acre.	Number of records.	Average cost of fertilizer per acre.	Cost of crop per acre.	Value of crop per acre.	Profit per acre.
$0	34	$0	$8.88	$14.18	$5.30
$0 to $1.99	29	1.42	10.46	19.58	9.52
$2 to $2.99	20	2.36	12.56	19.03	6.47
$3	20	5.01	15.37	19.33	3.96

[a] The fertilizers applied to previous crops largely determine the fertilizer applied to oats. Heavy applications to previous crops followed by moderate applications to oats constituted the most profitable practice.

Another way by which increased yields are obtained in the Belton area is by planting cowpeas. The cowpea is the only legume that is used extensively. It is planted principally after oats, but also in corn for soil improvement and for seed. Farmers in this section frequently furnish land rent free to croppers and tenants for planting cowpeas, it being assumed that the soil improvement resulting from growing the cowpeas is worth the use of the land.

In Table X the farms are grouped on the basis of the per cent of the crop area planted in cowpeas. The cowpeas include those planted either separately or with sorghum and millet. It can easily be seen from this table that the higher the percentage of crop land planted in cowpeas the higher are the yields of cotton and corn. This is an indication of the great value of the cowpea in obtaining yields.

TABLE X.—*Relation of the per cent of crop area planted in cowpeas to the yield per acre of cotton and corn.*

Per cent planted in cowpeas.	Number of farms.	Yield.	
		Net lint cotton.	Corn.
		Pounds.	*Bushels.*
5 per cent or less	38	222	15.6
6 to 10 per cent	33	252	18.0
11 per cent or more	39	277	20.8

The preparation of the land and the cultivation of the crops are other factors affecting yields. These depend on the labor devoted to tillage and the quality of the work. Labor used is frequently an individual problem or a matter of judgment. The amount of work that can profitably be done in preparing land for planting and in cultivating crops varies with the condition of the land, the prevalence and kinds of weeds present, the earliness or lateness of the season, the rainfall, etc. For this reason any study based on the labor devoted to tillage per acre may be misleading. It may be noted, however, that the farmers who used above the average amount of man labor and mule labor, both in preparing the land and in cultivating the crop, produced the most cotton and corn per acre.

The quality of the tillage depends upon both the character of the implements used and the efficiency of the men and mules operating them. A careful man with a strong mule may do better work with a one-horse plow than an inefficient man using two small mules and a two-horse turnplow. On the whole, however, farmers using good implements and good work stock made the best yields, even where the same amount of fertilizer was used. More improvement can be made by increasing the quality of the tillage than by increasing the labor devoted to it. It is not possible, however, to increase the yields in this region as much by improving the tillage as by increasing the application of fertilizers and by growing more legumes.

Live stock, because the number kept is small, does not have a marked effect on yields in this area. On the farms that keep the most stock, however, there is a tendency to devote the poorer grades of land to pasture and to plant more cowpeas. This leaves a better grade of land for crops, which, with the improvement from the pasture and cowpeas upon the poorer land and the manure from the live stock for the crop, gives better yields than are made on the average farms.

The variety of seed planted also has a direct bearing on yields. Farmers who planted Cook and Cleveland Big Boll cotton (see Table XI) obtained the best yields. Marlboro Prolific was the best-yielding variety of corn. It is noticeable that the farmers who take an interest in the kind of seed they plant are the ones who make the best crops. Farmers whose interest in the seed is so little they do not know the variety they plant are the ones who have the poorest yields.

TABLE XI.—*Varieties and yields of cotton and corn.*

Variety of cotton.	Number of farms.	Yield of net lint per acre.	Variety of corn.	Number of farms.	Yield per acre.
		Pounds.			*Bushels.*
Cook	35	248	Marlboro Prolific	36	19.9
Cleveland Big Boll	24	242	Not specified	55	16.3
Not specified	22	230			
Christopher	11	228			

Yields in this area could be increased by the use of lime, but comparatively little has been used. Winter cover crops of crimson clover, burr clover, and rye are advisable, but these crops are not grown to any considerable extent for this purpose. Planting vetch with oats for hay is profitable, but thus far only a few farmers do this.

ACRES PER WORK ANIMAL AND SIZE OF FARMS.

In the management of a farm the business should be so adjusted that the unit of organization can be utilized at its optimum capacity. In the Belton area, where cotton is the main crop, the work animal, usually in this case the mule, is the pivot around which the unit of organization is built. Usually there is one mule for each family, as one mule can do the plowing for all the crop the average family can handle, and one-horse implements are the kind commonly used. The number of acres per work animal is therefore an indication of the utilization of the labor and equipment and of the efficiency of the farm organization.

ACRES PER WORK ANIMAL.

The most profitable acreage of crops per work animal in the Belton area can be closely approximated from the data in Table XII. The table shows that as the crop-area per mule increases, profits increase until an acreage of 20 to 23 acres is reached. Individual cases such as might occur when an old man or a boy does the plowing or when a poor mule is used may make smaller acreages more desirable; the data in the table represent the averages for the area. The rate of income on the investment, 4.32 per cent, and the income per mule, $422, are both highest in this group. When the acreage became higher than this the farms became less profitable.

TABLE XII.—*Relation of crop area per work animal to farm efficiency.*

Number of crop acres per work animal.	Number of farms.	Per cent of return on investment.	Income per mule.
11 or less	7	2.64	$238
12 to 15	13	3.30	267
16 to 19	33	3.67	324
20 to 23	28	4.32	422
24 to 27	23	3.62	396
28 or more	6	2.86	386

It is of interest to note in this connection that for each acre per mule above or below 21.5 the effect on profits was the same, on the average, as a reduction in yield of 8 pounds of lint cotton per acre.

SIZE OF FARM.

For many reasons it is easier to get efficient organization on large farms than on small ones. Suppose that, in a given type of farming, from 20 to 23 acres is the most profitable acreage per work animal, and the size of farm is 200 acres. Then either 9 or 10 work animals could be used efficiently. With 9 mules we have 22.2 acres per mule, while with 10 we have 20 acres per mule. But suppose the farm contains only 30 acres of crop land. In this case the problem of utilizing the work stock to best advantage is difficult, for 30 acres is too much for one mule and not enough to keep two mules properly occupied.

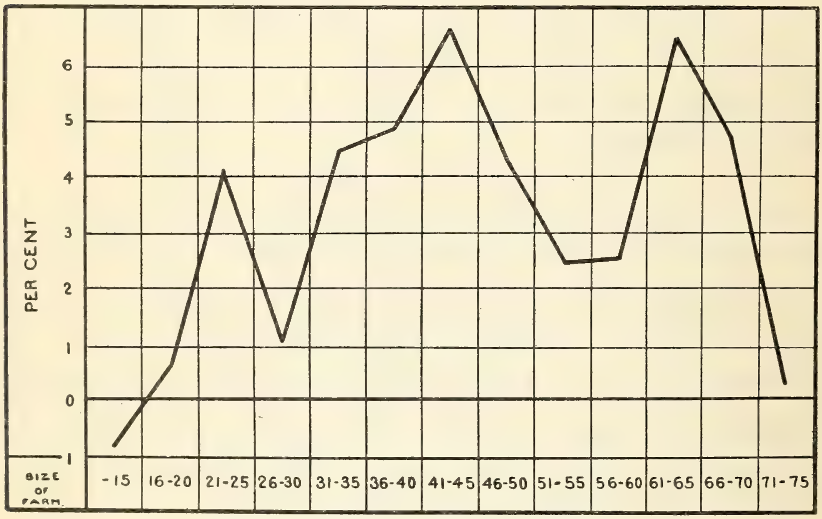

FIG. 6.—Relation of size of farm to per cent return on investment.

Let us see if we can find the sizes of farms as now organized which are most profitable in the Belton area. This can be done by placing the farms in groups differing in size by 5 acres and noting the per cent return on the investment and the income per mule in the various groups. In Table XIII the farms are grouped in this manner. The first group consists of two farms of less than 15 acres each, which lack 0.41 per cent of paying interest on the investment, and have an income of only $221 per mule. The profits increase as the size increases until the size is 21 to 25 acres, after which profits drop. They increase again and reach another high point at 41 to 45 acres. After this profits decline again, then increase and reach a third high point at 61 to 65 acres, following which there is another decline. Farms of more than 75 acres were not used in the table, as they were not sufficiently numerous.

TABLE XIII.—*Relation of size of farm to efficiency.*

Size (acres).	Number of farms.	Group.	Per cent of return on investment.	Income per mule.
Less than 15	2	C	[a]—0.41	$211
16 to 20	10	B	.68	288
21 to 25	11	A	4.13	341
26 to 30	6	B	1.08	258
31 to 35	7	C	4.32	311
36 to 40	11	B	4.80	352
41 to 45	9	A	6.74	412
46 to 50	13	B	4.22	299
51 to 55	7	C	2.43	315
56 to 60	2	B	2.52	239
61 to 65	7	A	6.63	398
66 to 70	4	B	4.70	457
71 to 75	3	C	.23	304

[a] Loss.

This table illustrates an application to farm-management studies of what is known as the law of recurring efficiency. As the size of the business increases (see fig. 6) a point is reached where the single unit of organization can be utilized most profitably. For some distance above this point the size does not permit the proper adjustment of the unit, and the business loses efficiency. As the size keeps on increasing another point is reached where two units fit in well, and a high point of efficiency is again reached. These high points, or the periods of efficiency on these farms, were on farms having 21 to 25, 41 to 45, and 61 to 65 acres per farm. Comparing these data with the most profitable acreage per work animal, it can be seen that these sizes are sizes for well-organized one, two, and three mule farms. Farms that were too large or too small for a given number of mules were less profitable. There were only a few farms in each of the groups in this table, but the influence of efficient sizes is so strong that a large number of farms is not required to discern the effect.

We may now take those farms having the more favorable sizes, namely, those of 21 to 25, 41 to 45, and 61 to 65 acres, and compare them still further with those having less favorable sizes. In Table XIII the groups of farms are labeled A, B, and C, as an indication of the favorableness of size, the A groups having the most favorable and C the least favorable size. By combining all the A groups into one, the B groups into another, and the C groups into a third, the effect of the favorableness of size can be clearly seen. The farm income, the labor income, the per cent return on the investment, and the income per mule (see Table XIV) are all highest on the farms having the more favorable sizes. In the A groups the farm income is 48 per cent higher than, and the per cent return on the investment more than double, that in the C groups.

TABLE XIV.—*Relation of favorableness of size of farms to efficiency.*

Size group.	Number of farms.	Investment.	Farm income.	Labor income allowing on investment—		Per cent return on investment.	Income per mule.
				8 per cent.	5 per cent.		
A	27	$5,487	$501	$62	$227	5.68	$379
B	46	5,452	374	− 62	102	3.52	315
C	19	5,776	339	−123	53	2.45	301

In Table XV it is seen that in every case the crops were produced at the lowest cost on the farms having the more favorable sizes. In addition to this, the average value of the dwelling was highest on these farms, and not only were the dwellings the most valuable, but these farms could also best afford them, for the value was only one and one-half times as great as the farm income, while on the farms of the groups having the least favorable sizes, the value of the dwellings was twice that of the farm income.

TABLE XV.—*Relation of favorableness of size of farm to cost of producing crops, and ratio of value of dwelling to farm income.*

Size group.	Cost per unit.					Average value of dwelling.	Ratio of value of dwelling to farm income.
	Cotton per pound, gross lint.	Corn per bushel.	Oats per bushel.	Cowpea hay per ton.	Wheat per bushel.		
A	$0.1033	$0.914	$0.389	$16.77	$0.829	$776	1.549
B	.1162	1.089	.400	18.05	1.335	668	1.786
C	.1149	1.118	.509	16.71	1.895	689	2.032

Farms having the more favorable sizes had a lower cost per productive man day and mule day of work, and also higher yields of crops than the others. (See Table XVI.) Each productive man day's work cost $1.18 in the A groups as compared with $1.30 in the C groups. The cost per productive mule day in the A groups was $1.34 as compared with $1.36 in the C groups. These differences were not great, but they show greater efficiency in the farms with the favorable sizes.

TABLE XVI.—*Cost of man and mule labor and yields of cotton and corn per acre by favorableness of size of farms.*

Size group.	Cost per man day.	Cost per mule day.	Yield per acre.	
			Net lint cotton.	Corn.
			Pounds.	*Bushels.*
A	$1.18	$1.34	268	19.0
B	1.27	1.37	241	18.1
C	1.30	1.36	235	16.4

The most noticeable difference is in the yield of crops. Cotton made 268 pounds of net lint per acre on farms having the more favorable sizes and 235 pounds on those of the C groups, while corn made 19 and 16.4 bushels, respectively. Not only do the farms with the more favorable sizes handle the labor more efficiently, but since the acreage is such that labor is utilized to good advantage, the crops were properly tended and good yields resulted. It is also noticeable on these farms that where a man is efficient in one thing he is also likely to be efficient in others. When a farmer has the foresight and ability to adjust the size of his farm so that the labor and equipment have a high degree of efficiency, he will also usually have the ability to secure yields that are above the average.

Handling the farm in such a way that the unit of organization can be used at its optimum capacity is therefore one of the important factors in determining the success of a farm. The farmer who has an acreage too small for one mule should rent, clear up, or buy more land. Or, if he has too much for one and not enough for two, say 30 acres, for example, he should either rent out some land, retaining enough to make an efficient size for a one-mule farm, or in some way add to his acreage sufficient to make a good two-mule farm. A man with 55 acres of crop land has too much for two mules and not enough for three, but if he would rent out 10 acres and make a two-mule farm, or rent, buy, or clear up 10 acres more and run a three-mule farm, his profits would be greater. Another way of handling such situations as this is to plant certain more or less intensive crops. If the acreage per mule is too small, one may plant crops requiring more labor; or if the acreage is too large, a larger acreage of extensive crops like corn may be planted. But where cotton is the predominating crop, neither of these methods is so satisfactory or so profitable as adjusting the size of the farm to give the optimum acreage per mule.

The relation of size of farm to efficiency in the Belton area can also be studied by comparing the farms having different numbers of work animals per farm, for here size is commonly designated thus. In Table XVI and figure 6 it can be seen that farms that had from 41 to 45 acres, or a good size for two mules, were for their size more profitable than the 1-mule and 3-mule farms. In comparing farms of different sizes one difficulty is that the small farms frequently have unfavorable acreages for the efficient use of work animals. In fact this is one of the weak points in the organization of small farms. For that reason, in order to make a better comparison, farms having only 17 or more acres per work animal are used in Table XVII. In this grouping, also, farms using two head of work stock were most profitable. The 2-mule farms had the highest per cent return on the investment and made the most cotton per acre, though the yields of corn were not so good as in the group having four or more mules. Evidently a two-mule farm with the proper acreage per work animal is the best size of farm for this community.

TABLE XVII.—*Relation of number of work stock per farm, on farms having 17 or more crop acres per work animal, to per-cent return on investment and yield of crops.*

Number of work stock per farm.	Number of farms having 17 or more acres per work animal.	Per cent return on investment.	Yield per acre.	
			Net lint cotton.	Corn.
			Pounds.	*Bushels.*
1	17	3.02	220	18.6
2	37	4.82	246	16.6
3	13	3.73	233	17.2
4 or more	17	3.32	242	19.6

There are several reasons for the relatively high efficiency of the two-mule farm. The operator himself usually works, and he takes more interest in the laborer and the laborer in him than where there is a larger number of laborers on the farm. Frequently, also, the second mule is worked by the operator's son, and all the labor is performed by a single family. This tends toward increasing the efficiency of the labor. Furthermore, the two-mule farms can use two-horse implements, giving a more economical use of man and mule labor. Frequently one man with two mules can do the plowing and cultivating while another man is doing handwork. Also, the work animal is not necessarily idle when the plowhand is doing handwork, as it is on a one-mule farm.

A high degree of managerial skill is not needed on a two-mule farm, as the business is not complicated. It was noted in this survey that the value of the operator's services, on the average, did not increase until farms using more than two mules were reached, showing that on this size of farm managerial ability was not of such importance as to command a premium.

COMBINATION OF ENTERPRISES.

In newly settled areas, where agriculture is largely in the experimental stage, the combination of enterprises, or the type of farming, is the factor that usually has most to do with variation in farm profits. But as the agriculture grows older fewer mistakes are made in this respect, for the farmer who fails to include the most profitable enterprises in the organization and give each its proper weight soon finds his business so unprofitable that he must either change his methods, quit farming, or be content with a poor living. For this reason, in any old established area where the standard is already high there is not as much opportunity to improve the efficiency of farms by changing or adjusting the combination of enterprises as there is by increasing yields or by organizing the farm so the unit of organization can work at its optimum capacity. On the farms visited in this survey the combination of enterprises in increasing the per cent return on the investment is now only one-fourth as important as yields and only three-fourths as important as the crop area per work animal. However, because of the importance of the combination of enterprises in the past, and the continual efforts that will be made to find a more profitable type, this factor will be discussed at some length. Furthermore, the introduction of a new crop or a sudden change in economic conditions may make the combination of enterprises the most important factor in determining success.[1]

CHANGES IN THE TYPE OF AGRICULTURE IN ANDERSON COUNTY.

Within the last three-quarters of a century Anderson County has changed from grain and live-stock farming to cotton farming. In 1840 grain and live stock predominated even to a greater degree than cotton does to-day. In Table XVIII the census data showing changes in the agriculture from 1840 to 1910 are given, and in Tables XIX and XX the relative importance of the principal crops and the various kinds of livestock are shown. More of the land is now in cultivation than in 1840, primarily because of the increase in population. Of the land devoted to cotton, corn, oats, and wheat in 1840, cotton was planted on 12.8 per cent, corn on 69.9, oats on 7, and wheat on 10.3 per cent. In 1910 cotton occupied 63.3 per cent, corn 25.9, oats 8.4, and wheat 2.4 per cent of the total land devoted to these four crops. The positions of cotton and corn have been reversed, while oats on the average occupies about the same position and wheat a much lower place than it did in 1840. The greatest change in the type of agriculture took place from 1870 to 1880, when the percentage of land planted in cotton more than doubled, increasing from 21.7 to 43.5 per cent, while corn decreased from 61.8 per cent to 35.5 per cent.

TABLE XVIII.—*Census data showing changes in the agriculture of Anderson County, S. C., 1840 to 1910.*

		1840	1850	1860	1870	1880	1990	1900	1910
Improved acres in farms		....	178,455	133,249	96,228	192,820	220,406	246,933	260,546
Per cent of land in farms improved		....	38.7	31.1	23.9	43.0	50.3	57.0	58.6
Cotton	acres	....	....	....	....	61,060	100,960	123,992	133,343
	bales	4,698	5,003	3,758	5,274	21,897	41,530	41,679	55,881
Corn	acres	....	....	....	....	49,953	58,055	58,507	54,489
	bush	698,519	820,549	579,682	409,688	492,646	547,217	596,140	663,264
Oats	acres	....	....	....	....	12,776	19,288	8,862	17,804
	bush	69,988	209,067	28,761	34,213	94,613	163,231	76,990	277,702
Wheat	acres	....	....	....	....	16,754	14,558	17,164	4,891
	bush	106,105	120,382	95,065	77,169	101,950	81,818	118,010	38,947
Horses and mules		5,626	5,796	4,817	3,946	5,585	6,761	8,515	10,742
Cattle		18,499	19,215	17,398	11,337	11,816	13,139	14,876	18,530
Sheep		10,387	13,135	11,951	10,534	3,698	1,730	602	245
Swine		36,381	43,242	26,058	16,167	10,695	12,178	12,360	11,163

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[1] An illustration of the latter is the indigo industry in South Carolina. When a substitute for indigo was discovered indigo farming immediately became unprofitable. Increasing the yield would have been of no avail. The big problem of the farmers was to find a new combination of enterprises suitable for the conditions, and until this was done the farms remained unprofitable.

Cattle have barely held their own in Anderson County, there being 18,499 in 1840 and 18,530 in 1910. As compared with population, they have decreased in relative numbers and importance. Sheep have declined from 10,387 in 1840 to 245 in 1910, while in the same period hogs declined from 36,381 to 11,163. These figures for live stock in 1840 are hardly comparable with the 1910 census, however, as the last census was taken in April, while in other years the census was taken in June, thus including a larger number of young stock.

TABLE XIX.—*Percentage of area devoted to principal crops, by decades, Anderson County, S. C.*

Crop.	1840[a]	1850[a]	1860[a]	1870[a]	1880	1890	1900	1910	112 farms, Belton area, Anderson County, 1914.
Cotton	12.8	10.6	12.7	21.7	43.5	52.3	59.5	63.3	63.1
Corn	69.9	63.9	72.2	61.8	35.5	30.1	28.1	25.9	23.6
Oats	7.0	16.3	3.6	5.1	9.1	10.0	4.2	8.4	12.1
Wheat	10.3	9.2	11.5	11.4	11.9	7.6	8.2	2.4	1.8

[a] Acreages of crops were not given in the census of 1840, 1850, 1860, and 1870. These were estimated by taking the average yield for 1880, 1890, 1900, and 1910, and dividing it into the total yield of the years when acreages were not given. From these estimates the percentages in Table XIX and the acres per animal in Table XX were computed for the farm by decades.

Though the agriculture of the county made large developments from 1840 to 1910, live stock either declined or was at a standstill. Consequently, of more significance than the change in the number of live stock is the decline during this time in the importance of livestock as related to the crops. This can best be shown by the number of animals of a specified kind there were for each 100 acres of land planted to cotton, corn, oats, and wheat in each decade. In 1840 there were 19.2 head of cattle, 10.9 head of sheep, and 35.8 head of swine for each 100 acres of these four crops. In 1910 there were 8.8 head of cattle, one-tenth of a sheep, and 5.3 head of swine for the same acreage. Stated in another way, in 1910 cattle as related to the crops were only 46 per cent, sheep 1 per cent, and hogs 14 per cent as important as they were in 1840, making no allowance for possible discrepancies in the census reports. The greatest falling off in live stock was from 1870 to 1880, or in the decade when there was the largest increase in cotton and the largest decrease in corn. The decline in hogs has followed the decline in corn and the increase in improved land, as the hogs were dependent upon corn and range for support.

TABLE XX.—*Number of specified animals per 100 acres of land planted in cotton, corn, oats, and wheat in Anderson County, S. C., 1840 to 1910.*

	1840	1850	1860	1870	1880	1890	1900	1910
Cattle	19.2	15.6	22.7	17.8	8.5	6.8	7.1	8.8
Sheep	10.9	10.6	15.4	16.7	2.6	.9	.3	.1
Swine	38.5	34.5	33.3	25.6	7.6	6.3	5.9	5.3

COMBINATION OF ENTERPRISES SUITABLE FOR THE BELTON AREA.

CROPS.

The cost of producing crops is an indication of the type of farming that should be followed. With costs computed by standard cost-accounting methods, cotton was produced at a profit. Corn and wheat were produced at an apparent loss, but oats and cowpeas were grown at a profit. To understand fully the relation of these costs to the type of farming, however, two things must be borne clearly in mind. One is that if the labor and equipment were not used for the minor crops they would otherwise be idle. In computing these costs, labor and equipment were charged at their full value against the minor crops, but nevertheless it would have been wise to use them in growing these crops even though they earned only a part of their real value, for otherwise they would have earned nothing. For this reason, although the indicated cost of producing corn, when computed by standard cost-accounting methods, is more than the value, it is nevertheless profitable to grow some corn when the farm is considered as a whole. In fact, by growing the minor crops, even though they do not give a full return for the labor and equipment, it is possible to grow the major crop at a lower cost than otherwise, for in this way the charges against it for these items are reduced. If, however, the major crop can not make up for the lower return on the minor crop, the system of farming will become unprofitable.

The second point in regard to type to be considered is that a crop may be produced profitably for home consumption, but when sold in the markets of the world it may be unprofitable. The reason for this is that as long as crops are produced for home consumption they have a value equal to the retail price, but when any more than this is grown the value of the surplus immediately falls to the wholesale price, except for a limited amount that may be retailed locally. This may be illustrated by oats, which were produced in the Belton area at a cost of 43.3 cents per bushel. Oats shipped into Belton come from the Middle West, and there are dealer's, elevator, sacking, and freight charges attached to the prices received by the grower. As this is written there is a difference of 20 cents per bushel in the wholesale price of oats at Champaign, Ill., and Columbia, S. C., the price at the former place being 38 cents and at the latter 58 cents. By the time the oats pass through the local dealer's hands at Belton and reach the farmer at a retail figure the price is 65 cents per bushel. So long as the farmer in the Belton area can grow oats for 43.3 cents per bushel it is cheaper for him to produce the oats needed for his farm than it is to buy them, and he can even to a limited extent compete in the local market with the middle western grower. But when he sells outside the local market and has to pay dealer's, bagging, and shipping charges, or when he produces so much oats that the straw can not be utilized, so that the credit of the straw against the cost of production declines, which in reality increases the cost per bushel, he can not compete with the middle western man who produces his oats at a lower cost. The ability to grow minor crops with labor and equipment that would otherwise be unemployed, and the fact that these crops when purchased are bought at a retail price and when sold are sold at a wholesale price, establish very definite limits to the extent to which the minor crops can be profitably grown. As soon as the farm and possibly a limited local market are supplied the profitable outlet for the minor crop is gone. With cotton, the major crop, it is otherwise. Cotton is sent into the markets of the world, where it can meet competition with cotton from other countries. Consequently it has a wide range of adaptability on these farms, while with the minor crops the limits, as just shown, are well defined. This makes it profitable for these farms to produce feed crops necessary for home consumption, but if any considerable amount more or less than this is grown there will be a decline in the profits. It was noticeable from a study of individual cases that farms that produced the feed crops for home use and had just enough to insure this supply were the ones that made the most money. Those that purchased feed were the least profitable.

We may see from Table XXI how the crops are distributed on farms having different acreages per work animal. In the group planting 11 acres or under per mule, the percentage of land in cotton was lowest and the percentage in feed crops highest. The per cent of land planted in cotton increased and that in feed crops decreased as the acres per work animal increased until the group planting from 20 to 23 acres was reached. With acreages higher than this the relative distribution of crops was about the same. This table shows the natural tendency of farmers is to produce the feed crops before planting cotton.

TABLE XXI.—*Relation of crop area per work animal to distribution of crops.*

Crop acres per work animal.	Average crop acres per work animal.	Acres per work animal.				Per cent of crop area planted in—			
		Cotton.	Corn.	Oats and oat hay.	Cow-peas.	Cotton.	Corn.	Oats and oat hay.	Cow-peas.
11 or less	10.0	5.2	3.5	1.3	0.9	50.9	34.9	14.2	11.0
12 to 15	13.8	8.1	3.9	1.8	1.2	58.1	27.7	14.4	9.9
16 to 19	18.0	10.3	5.0	2.5	1.7	58.6	24.6	15.8	10.5
20 to 23	21.5	14.2	5.5	2.4	1.6	64.9	23.7	11.7	8.4
24 to 27	25.3	16.0	5.8	3.0	2.5	64.9	20.5	11.8	9.2
28 or more	32.5	20.1	8.0	4.1	3.2	63.2	24.6	11.9	9.4
All classes (110 farms).	20.5	12.6	4.9	2.5	1.8	61.5	23.9	12.2	8.8

In determining the combination of crops that is most profitable for the individual farm the labor supply must be taken into consideration. Where there is an abundance of labor needing employment, cotton has an advantage, for it will furnish more profitable work per acre than corn or oats. If, on the other hand, the labor supply for a given acreage is scant, then, from the standpoint of the profits of the whole farm, the acreage of the more extensive crops should be increased. Under average conditions, however, the farms should grow the feed crops first and then plant all the cotton that can be handled.

Under normal conditions cotton is the crop that exerts the greatest influence on the profits of these farms. The amount of cotton produced per work animal, which is a result of both yields and acreage, is the best index of the efficiency of these farms. In Table XXII the farms are grouped on the basis of the number of bales produced per work animal. Twenty-seven farms that produced less than 5 bales per mule barely paid expenses and made only 0.5 per cent on the investment and $212 per mule. More cotton meant more profit, and on the 35 farms in the highest group, producing 7 bales or more per work animal, the return on the investment was 6.24 per cent and the income per mule $475. The total production of cotton, as can be seen from the last two columns of the table, was due both to the yields and acreages per work animal.

TABLE XXII.—*Relation of the number of bales of cotton produced per work animal to the returns of the farms.*

Number of bales per work animal.	Number of farms.	Per cent returns on investment.	Income per mule.	Crop area per work animal.	Yield of net lint per acre.	Acres of cotton per work animal.
				Acres.	*Pounds.*	
Less than 5	27	0.50	$212	18.3	195	9.1
5 to 5.99	20	1.92	273	19.4	247	11.4
6 to 6.99	28	4.66	334	20.8	249	12.9
7 or more	35	6.24	475	23.2	283	14.9

It is evident also from a study of the cost of production that more oats and cowpeas and less corn (see Table II) would increase the profits of the farms in the Belton area. Oats were produced at a profit, and corn, when costs are computed by standard cost-accounting methods, was produced at a loss. Furthermore, by planting oats the land is available for cowpeas, which, as has been shown, is an important factor in obtaining yields. Apparently farmers are realizing these things, for from 1900 to 1910 (see Table XVIII) the acreage planted in corn in Anderson County decreased, while the acreage of oats doubled.

LIVE STOCK.

The status of live stock on these farms is an indication of the live stock that should be kept. There was an average of 4.7 head of cattle of all kinds per farm owned by the operators on the 112 farms included in the survey of the Belton area. On January 1, 1915, the average farm value of all cows was $30.40 per head; of heifers a year old or older, $13.65; and of calves that would be yearlings in the spring, $4.98. These values indicate that there were either too many cattle, the quality was very poor, they were not properly distributed on the farms, or they were not of the right kind; that is, too many steers were kept in place of cows. Most of the cows having a considerable percentage of Jersey blood in them would, if bred to good bulls, soon produce high-grade dairy cattle well adapted to the region. It is utterly impossible, however, to raise calves to 9 months old for $4.98, and many times it is good luck to the farmer, as stated by many of them, if the calf dies or is killed when it is born. There is practically no market for veal calves in this area, but if good bulls were used, a better grade of cattle, that could be raised profitably, would soon be obtained.

There were three hogs of all kinds per farm on hand January 1, 1915. Pigs 3 months old were commonly valued at $3 to $5 apiece. One reason for the high price of pigs was that many farmers did not want to keep a sow, preferring to buy pigs of some one who raised them to sell. Cotton-mill employees also bought pigs, thereby increasing the demand. With the economic situation, existing at the time of this survey, conditions on the farms are not favorable for the growing of hogs except for the home meat supply. This is shown by the fact already stated that, as related to crops, hogs occupy only 14 per cent of the place in Anderson County that they did in 1840. One unfavorable condition is the high cost of producing corn and the consequent small amount that is now grown. Hogs went out of Anderson County as corn went out. Another drawback is that the soil is not suitable for pasturing peanuts, as is done in some parts of the coastal plain section of the South where there is less clay in the soil, as the rooting of the fields in wet weather puddles the soil and puts it in poor condition for future crops. A third reason is that cowpeas, which are used in growing hogs, do not do as well as in the lower part of the State. Hogs, however, sufficient for home consumption are profitable on these farms.

The conditions in this area are also unfavorable for the production of beef cattle. One proof of this is the remarkable decline in the relative importance of cattle to crops within the last three-quarters of a century. The high cost of producing feed is another. The production of beef cattle divides itself into two phases—one the production of stockers and feeders, and the other the finishing of the cattle for the market. The former requires cheap range, and the latter cheap concentrated feed. In Anderson County the value of the land is high as compared with the range or grazing it affords. Including woodland and waste land, the average value of the 112 farms surveyed was $57.06 per acre, when only 52.8 per cent of this was in cultivation, most of the remainder being in woodland. With this price of land and the quality of grazing the pastures in this area afford, stockers and feeders can not be profitably produced except on very limited areas of waste land, or on land that is too poor for growing crops profitably, yet which will furnish some grazing. Cottonseed meal and hulls have been used for fattening cattle in South Carolina, but even when silage was added to the ration, this method of fattening cattle appears to have been not entirely satisfactory. When meal was worth $20 per ton and hulls $4 per ton, and feeders could be bought cheaply in the mountains of North Carolina and Tennessee, many farmers throughout the State fattened cattle for the market, but as other cattlemen from other parts of the country competed for the feeders, and the price of meal and hulls went up, South Carolina farmers went out of the business, and only a small percentage of the number of cattle fattened in this way 10 years ago are now fattened in the State. Farmers in the corn belt of the Middle West, where the cost of producing corn and hay is much lower than it is in the Belton area, have an advantage in fattening cattle over the Anderson County farmer, which, under the conditions, can not be overcome. Another factor that is against the growing of beef cattle in this area is the density of the population. There is already one family for less than 25 acres of cultivated land. If the family makes a living, the farming must be intensive. Beef-cattle farming, particularly raising stockers and feeders, is an extensive kind of farming requiring comparatively much land and little labor. If such a type were established in the Belton area, much of the labor would be thrown out of employment. These considerations explain why beef cattle are not found on these farms and furnish substantial proof that conditions are not favorable for the production of beef cattle in this area.

The number of sheep in the entire county in 1910, according to the census report, was only 245. Consequently, this branch of live stock need not be discussed, except to say that the same competition of the western ranges that drove sheep out of New England also drove them out of South Carolina. However, the conditions which caused the abandonment of sheep in this county several years ago are now changed, and it is well worth considering whether in view of the shortage in wool and mutton it would not be profitable to farm owners to have small flocks of sheep as a part of the system of diversified farming. A small flock of sheep, like a small flock of chickens, can be maintained on the average farm with very little outlay for maintenance.

The average number of chickens per farm was 41. There were a few farms with more than 100 hens. Some of the large flocks were profitable, and some were not, the small number of eggs obtained annually per hen being the chief cause of losses. Most farms raised chickens for home use only, as under present conditions there is only a very limited market for the surplus products. The number of chickens per farm in any region is usually influenced by the type of agriculture. Chickens are kept largely as scavengers, and the section that produces grain and live stock is the one where the most chickens are found. On most farms of a general type, when chickens have to be fed to any considerable extent, they become unprofitable unless handled with the skill of a professional poultryman. In Anderson County, where so high a percentage of the land is planted in cotton, and where such a comparatively small amount of grain is grown and not much live stock kept, it does not take many chickens to consume the waste, and when more than the number needed for this is kept, only a few farmers find them profitable.

There are evidences on every hand that although live stock has and should have an important place on the farms for home use, the county as a whole is not well adapted to live-stock production. It takes feed to grow live stock. The kind of live stock grown on the farms of the Belton area is an indication of the shortage of the feed supply and the high cost of producing feed in this region. The work stock are mostly mules, the cattle have a high percentage of Jersey blood, and the chickens are small sized and of the egg-laying strains—all facts attributable to the limited supply of feed. Regions that have an abundance of feed use horses instead of mules, produce as a rule cattle of larger frame than the Jerseys, and grow chickens of the meat-producing strains. In few sections of the country is less feed wasted than in such regions as the Belton area. Fodder was "pulled" on every one of the 112 farms surveyed and from practically all of the corn that was grown. Any kind of forage that can not be profitably harvested is pastured some time during the year. One main cause, therefore, of the status of live stock on these farms is the short supply of feed and the high cost of producing it.

The keeping of live stock on these farms is, like the growing of feed crops, profitable only when primarily for home consumption. Dairy and poultry products are substantial articles of diet that no farmer can well afford to be without, even though the cost of production is high. Usually, however, even on cotton farms, some of the land pastured or the feed used would be wasted were it not for cattle. A few hogs can also be profitably kept, but the number is not large.

A few farms are apparently finding dairying in a small way profitable under their conditions. On these farms in most cases the families are large, and the work is done by the operator and his family. The family labor is comparatively cheap, which makes it easier to secure a profit from cows. Hired labor would make unprofitable some of the cows on the farms where they are now profitable.

SPECIAL FARMS AND NEW CROPS.

Some mention should be made of a few farms producing truck on a small scale and retailing it in the near-by towns. There is room here for only a few farms in this kind of business, but some of these, so long as they are able to find a market for the produce, are finding the business profitable. Irish potatoes were profitable, as shown by the cost of production, which was 52 cents per bushel, and the value, which was $1.01 per bushel. These are planted in July, well toward the end of the cotton-plowing season, and the cultivating is done during August and September, when there is not much other farm work to do. The rainfall in these months is also ample for growing potatoes. They may be left in the ground and harvested at any time during the winter. Late Irish potatoes handled in this way are a comparatively new crop and are grown on only a few farms, but because they are profitable and do not interfere with other crops it appears that 1 or 2 acres per mule would add to the profits of many farmers.

Alfalfa is also a new crop in this area, the possibilities of which are not yet fully known. Since the survey was made, alfalfa has been planted on 10 or more farms, and the fields appear promising. If the results are as good as have been obtained at Rock Hill, S. C., on a soil very similar in type, it should prove a valuable addition to the farms and greatly facilitate the growing of live stock needed for home consumption. An acre per mule carefully planted and handled should prove profitable. The velvet bean, which farmers are just beginning to plant, is also a promising crop in this section. Early varieties mature before frost, and, when planted with corn, the yield of corn is reduced little, if any, and a good yield of beans is obtained. The fodder on the corn can not be "pulled" where velvet beans are planted, but the soil improvement and the feed from the beans will ordinarily more than compensate for any loss incurred in this way.

Soy beans offer possibilities for this area. A few farmers already have planted soy beans for feed, but the limited market for the beans has prevented the extension of the acreage. Soy beans are now crushed for oil and meal by cotton-oil mills, so that there is a ready market for the seed. This should encourage farmers to grow the crop. Soy beans can be planted in rows in the spring immediately after cotton planting is finished. They are cultivated very much like corn and harvested for seed late in October or early in November. There are machines which straddle the row and pick and thrash the beans in the field. Soy beans can also be planted for hay after oats and wheat, and harvested in the same manner as cowpea hay. It is also probable that they can be planted after oats and harvested for the seed. Inoculation is necessary for best results.

CROP ROTATION.

The preceding pages show quite definitely the limitations of the various crops grown in this area. The most suitable crop rotation for the well-organized farm can therefore be determined quite accurately. Other crops may be added to this rotation and variations made to suit the individual farm. But if one of the rotations outlined below is followed, the necessary steps are taken to secure good yields, and the proper acreage of crops are grown per mule, the farm should prove profitable.

TABLE XXIII.—*Three methods of planning a five-year rotation for this area.*

Year.	1	2	3
First year	Cotton	Cotton	Cotton.
Second year	Cotton	Cotton	Corn with cowpeas.
Third year	Cotton	Corn with cowpeas	Cotton.
Fourth year	Corn with cowpeas	Cotton	Cotton.
Fifth year	Oats followed by cowpeas.	Oats followed by cowpeas.	Oats followed by cowpeas.

The average acreage and the most profitable acreage per work animal has been shown to be between 20 and 23 acres. Taking this as a basis, 40 per cent, or two-fifths, of the crop land will, under average conditions, grow the feed crops required for home consumption, leaving 60 per cent, or three-fifths, for cotton. This makes a five-year rotation, which may be cotton, cotton, cotton, corn with cowpeas, and oats followed by cowpeas, as shown in Table XXIII. In many instances it would also be advisable to plant oats after cotton and cotton after corn, as the oats can be drilled in the cotton rows, and less labor in planting would be required. The objection to planting cotton after corn is that the corn stalks interfere with the cotton cultivation. With 20 crop acres per mule in staple crops there would be five fields of 4 acres each, or, with 22½ acres, five fields of 4½ acres each.

In addition, there should be some miscellaneous crops which may or may not be made a part of the rotation. With 20 acres of staple crops per mule there would be 12 acres of cotton and 4 acres each of the other crops, or if there were 22½ acres, there would be 13½ acres of cotton and 4½ acres each of the other crops. With this as a basis, it would be an easy matter for the farmer to substitute 1 acre of oats and vetch for 1 acre of corn, and perhaps another acre of oats, followed by Irish potatoes, for a second acre of corn, if the individual case warranted it. This would require the feeding of a higher proportion of oats and hay to live stock than is now fed, but as the cost of producing these crops is relatively less than the cost of producing corn, the change would be profitable to the farmer. Alfalfa can be added to this cropping system as it is found profitable, and winter cover crops can be planted in cotton to increase yields.

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